

Shuttle Training Aircraft Makes First Test Flight

The first of two Space Shuttle Training Aircraft last month was rolled out at Grumman American Aviation's Bethpage plant and was flown on its first test flight September 29.

Modified from Gulfstream II jets, the STAs will be used as part-task crew trainers for the Shut-

tle Orbiter descent and landing profile. STA cockpit interiors have followed the Orbiter cockpit layout, and aerodynamic modifications provide motion and visual cues and handling qualities similar to those of the Orbiter.

Orbiter's atmospheric descent from 35,000 feet to flare-out and runway touchdown will be duplicated by the STA through direct-lift flaps for pitch control, and side-force control surfaces under the wings to simulate expected spacecraft sideward motion.

The two STAs will be delivered to JSC early next year after completion of test flights at Grumman. Flight crews for the Orbiter approach and landing test will begin training in the STAs in mid-year.

NASA Signs Pact For Two Orbiters

NASA and Rockwell International have signed a supplemental agreement which incorporates the follow-on development phase of the Space Shuttle Orbiter project into an existing contract.

The supplemental agreement formally incorporates the construction of Orbiters number 101 and 102, the Approach and Landing Tests and six orbital flight tests into an already existing contract for design, development, testing and evaluation of the Space Shuttle Orbiter.

This supplemental agreement was contemplated when the original Space Shuttle Orbiter contract with Rockwell was signed. The additional effort covered under the agreement represents work valued at slightly over \$1.8 billion and brings the estimated value of the Orbiter contract with Rockwell to slightly over \$2.7 billion. Rockwell was awarded the contract for Orbiter design, development, and integration with all other elements of the Space Shuttle system in July 1972.

Piland, Phinney Speak at AIAA

The AIAA Houston Section Wednesday will present a program "Potential Future Uses of Space" in which JSC assistant director for Advanced Planning and Design Robert O. Piland and Geology and Geophysics branch chief William C. Phinney will speak.

The program will be at the Gilruth Recreation Center with cocktails at 6, dinner at 7 and speakers at 8 p.m. (\$5/person) Guests are welcome and the deadline for reservations is 4 p.m. today with Dottie Hamilton or Virginia Nester at ext 4555, or Lillian Hudson at ext 4991.

Apollo Crew Returns, Starts US Tour Oct. 12th

Apollo crewmen Thomas P. Stafford, Donald K. "Deke" Slayton and Vance D. Brand this week returned from a two-week goodwill tour of the Soviet Union in which they were accompanied by their families and Soyuz crewmen Alexei Leonov and Valeriy Kubasov.

Soviet cities visited included Moscow, Leningrad, Volgograd, Kiev, Novosibirsk, Sochi and Tbilisi.

Leonov and Kubasov will rejoin the Apollo crew in Washington October 12 for a similar two-week tour of the United States. Activities in Washington include a White House visit and a reception at the Soviet Embassy.

Moving to Chicago, the ASTP crewmen will take part in a parade in the downtown Loop, luncheon and dinner ceremonies and a news conference.

Similar activities will be held the following day, October 15, in Omaha, Nebraska before the group moves west to Salt Lake City, San Francisco and Los Angeles for more press conferences, receptions, and a visit to the Rockwell International Corporation Space Division plant in Downey.

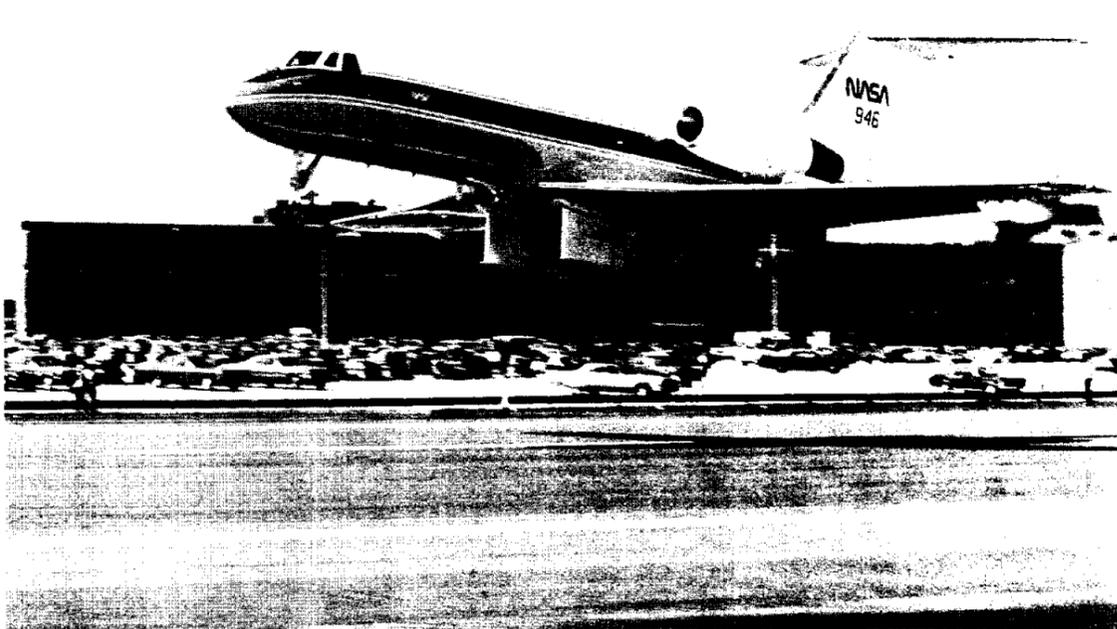
The crews will return to Washington October 22 for additional activities there before back-tracking to Atlanta and Nashville. The final tour stop will be at the United Nations in New York.

Marilyn Bockting Named To ABWA Top Ten Women

Marilyn J. Bockting, assistant to the Program Administrative Office manager, has been selected as one of the national Top Ten Women of the Year of the American Business Women's Association.

An independent three-judge panel selected Bockting from the business women recommended by the more than 1200 ABWA chapters. Selections are based on advancement in business with consideration given to continuing education and involvement in community affairs. As one of ABWA's "Top Ten," she is eligible for selection as the 1975-1976 "American Business Woman of the Year." Announcement of the recipient of this honor will be made tomorrow at the association's 26th annual national convention in Cincinnati, Ohio.

Bockting is a charter member of ABWA's Clear Lake Area Chapter



SHUTTLE PILOT CLASSROOM — A modified Grumman Gulfstream II, the first of two being prepared for Space Shuttle pilot training, lifts off the runway at Grumman American Aviation's Bethpage, NY plant on its first test flight September 29. Jutting beneath the wing roots are the side-force control surfaces used to simulate Shuttle sideward motion.

ROUNDUP

NASA LYNDON B. JOHNSON SPACE CENTER

HOUSTON, TEXAS

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JSC Fish Experiment to Fly on Soviet Biological Satellite

For the first time, US experiments including one from JSC will be flown on board a Soviet spacecraft.

Dr. David L. Winter, NASA Director for Life Sciences, announced that during the recent Joint US-USSR Working Group meetings on Space biology and Medicine, plans were completed for US experiments to be carried on an unmanned Soviet biological satellite expected to be launched late this year.

Four NASA-developed life sciences experiments are scheduled

to fly and seven tissue investigations will also be conducted by US scientists on materials supplied by the Soviets from their animal experiments. Six of these investigations involve rat tissues and the other *Drosophila* (flies).

NASA's Ames Research Center, Mountain View, Calif., is managing three flight experiments concerning plant cell culture, plant tissue growth and radiation, and all the tissue investigations. JSC is managing a fish egg development experiment.

The US experiments will be passive — completely autonomous from the spacecraft power, telemetry and data recording. They will be housed in five Soviet fabricated containers that are 17.8 centimeters (7 inches) long, 12.7 cm (5 in.) wide and 11.5 cm (4.7 in.) high. The maximum weight for each container including its experiments will be less than 2.5 kilograms (5.5 pounds).

Unique to this spacecraft is a Soviet designed onboard centrifuge. US experiments will be flown both on the centrifuge and on a stationary platform.

The four US flight experiments are:

1. *(K101) Plant Tumor Growth Experiment* — To study effects of weightlessness on sensitive plant systems. Carrot slices infected with crown gall tumor, a common plant tumor, will be packaged in two containers.

One container will be mounted in the spacecraft for weightlessness effects studies, and the second will be on the 1 gravity centrifuge aboard the satellite in order to compare the growth and cellular

dynamics of the tumors subjected to the weightless environment. Principal investigators are Dr. R. Baker and Dr. S. Kleinschuster, Colorado State University, Fort Collins, Colo.

2. *(K102) Carrot Cell Culture Experiment* — To study the effects of weightlessness on sensitive plant systems and determine the effects on normal development of embryonic tissues. Cultured carrot cells proceed through definitive stages of embryogenesis to the formation of embryos and small plantlets, similar to growth and development of the fertilized egg. Post-flight observations will be made to ascertain whether free carrot cells will undergo normal embryogenesis in zero gravity. Principal investigators

(Continued on page 4)

NSA Chapter Honors Bosses

The NASA Clear Lake Chapter of the National Secretaries Association Thursday will honor their bosses at a 7 p.m. dinner at the NASA Holiday Inn.

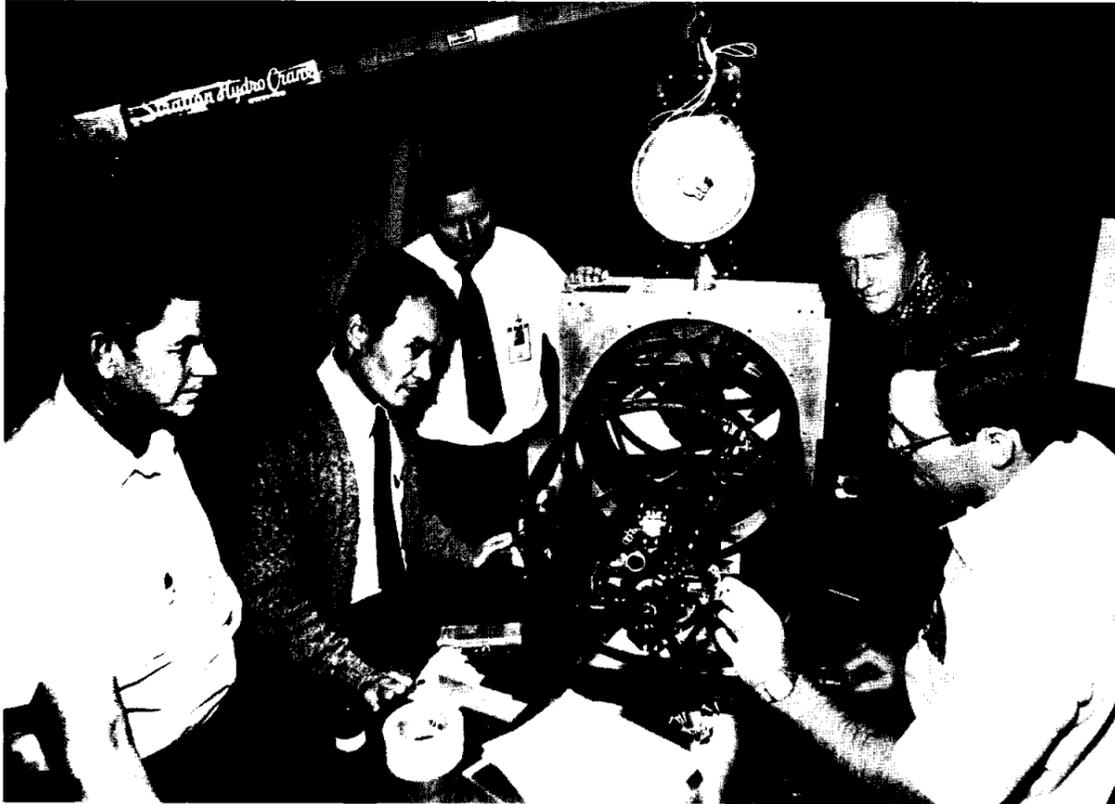
JSC Director of Procurement James L. Neal, 1974-75 Boss of the Year, will give the address and music will be provided by the Clear Creek High School chorale. The 1975-76 Boss of the Year selection will be announced at the meeting.

NSA chapter members nominate their bosses and a team of three non-NSA affiliated judges make the selection based on the secretary's written recommendation.

Virginia Thompson at 5441 has additional information on the dinner meeting.



JSC Superior Achievement Award in December, 1974. She is an officer of the JSC Exchange Council and the Federal Women's Committee.



SPACE TELESCOPE — American and Dutch scientists and engineers examine an improved Echelle Spectrograph Ultraviolet Telescope, the result of recent US-Netherlands cooperation in the field of UV astronomy. The UV telescope is currently undergoing laboratory testing prior to a balloon test in February, and is one of the planned payloads for the Shuttle Orbiter. The instrument will be used in investigations of stellar chromospheres, the dynamics of extended atmospheres of supergiants and other special class stars. The Echelle Spectrometer UV telescope will replace an earlier JSC-fabricated Ebert-Fastie spectrometer which has been flown as part of the JSC Balloon-borne Ultraviolet Stellar Spectrometer (BUSS) experiments. Left to right are: Glenn Teasley, Lockheed Electronics engineer; Dr. Yogi Kondo, JSC BUSS project scientist; David White, JSC project manager; Roel Hoekstra, project engineer/scientist from the Netherlands Space Research Laboratories; and Curtis Wells, LEC project engineer.

Teresa Sullivan Named As September Secretary

Teresa R. Sullivan, secretary to Control Systems Development Division assistant chief T. V. Chambers, was selected JSC Outstanding Secretary for September.



“Miss Sullivan is an extremely hardworking and efficient secretary whose high qualities and loyalty, motivation and helpfulness have impressed all persons with whom she has come into contact,” said Chambers. “Her work is exceptionally accurate, neat and thorough and is completed expeditiously. She performs exceedingly well under pressure and has displayed an exceptionally high degree of judgment in the performance of her responsibilities.”

Chambers said that she has a knowledge of technical terminology, procedures and documentation

that allows her to accomplish tasks more befitting a staff assistant than a secretary. Because of her knowledge of Shuttle documentation within CSDD, she is also called upon by other JSC organizations for help in obscure data retrieval cases.

NASA Holds LNG Workshop

NASA sponsored a workshop September 30 at the Kennedy Space Center, Fla., on management procedures for storing and handling liquified natural gas (LNG). Some 74 government and industry officials from throughout the country attended.

Purpose of the workshop was to outline risk management procedures developed by NASA as a result of its long experience and impressive safety record in storing and handling highly volatile rocket fuels.

These procedures, called the Risk Management System (RMS), are essentially a comprehensive series of checklists and worksheets designed to aid management to:

Determine risks by means of engineering and analysis and tests,
Control these risks by establish-

ing redundant and fail safe techniques, and
Establish the criteria to permit decisions that eliminate or accept certain risks.

RMS can also be applied to other hazardous operations where a management technique is required.

The use of imported LNG — a super-cooled liquid, minus 256 degrees F. — is expected to increase dramatically in the next few years as domestic sources of natural gas are depleted. In fact, the Cryogenic Data Center of the National Bureau of Standards estimates that U.S. consumption of LNG will jump from its present level of about two million cubic feet annually to about two trillion cubic feet by 1980. Thus, a systematic risk management system as exemplified by RMS, will provide municipalities and industry with a safe, systematic approach in dealing with LNG.

The day-long workshop included presentations by the RMS Study Managers, Otto Fedor and Fred Shoenberger of the Kennedy Center and William Parsons of the Boeing Company. New York City Fire Commissioner, John O'Hagan, discussed how his department is already using RMS.

Louis Mogavero, Acting Director of the NASA Technology Utilization Office — under whose auspices the workshop was held — described NASA's comprehensive effort to make available as widely as possible the advanced technology and expertise resulting from NASA's programs.

ROUNDUP

NASA LYNDON B. JOHNSON SPACE CENTER HOUSTON, TEXAS



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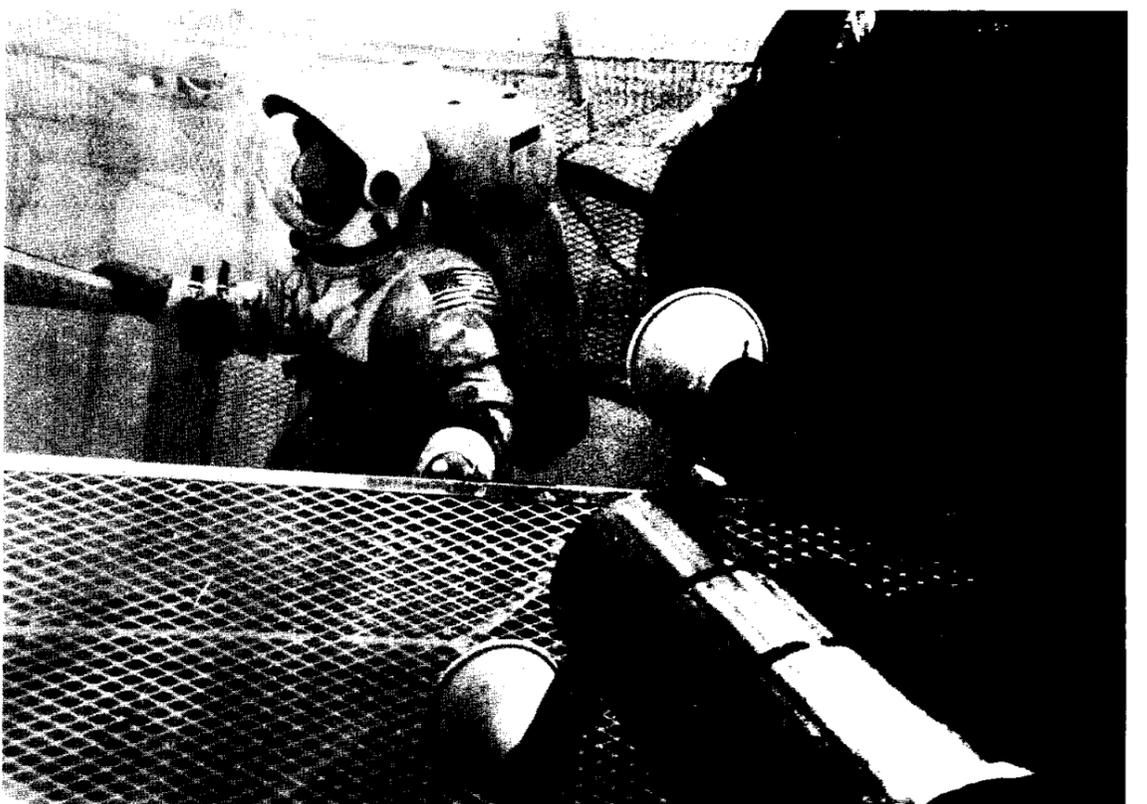
Bond Participation Up in 1975

NASA's 1975 Savings Bond campaign resulted in an agency-wide participation of 76.8 percent, an increase of 4.6 percent over last year.

Involved were 1,137 new buyers. One installation, the NASA Pasadena Office, compiled a participation record of 100 percent, while four others — JSC, Kennedy, Langley and National Space Tech-

nology Laboratories — had records of more than 80 percent and earned Minuteman flags. KSC employees topped 90 percent for the seventh consecutive year.

The new and increased deductions will result in yearly additional savings of more than \$784,000 for a total NASA employee savings of more than \$14,600,000.



LIFE SPHERES — Physician-astronaut Story Musgrave tows five mockup spheres in a requirements-development test October 1 for the Space Shuttle Personnel Rescue System in the JSC Bldg 260 water tank. The 34-inch diameter plastic spheres were weighted for neutral buoyancy. Musgrave ran a simulation of transferring five of the PRS spheres from the Orbiter mid-deck and airlock through the side hatch. The PRS, one of several designs being considered, would be used for transferring unsuited Orbiter crewmen in an inflight emergency. The suited crewmen would tow the unsuited crewmen, zipped up in their spheres, from the crippled vehicle to the rescue Orbiter. A rescue support umbilical supplies oxygen and maintains sphere inflation at 5 psi, and each rescuee will also have a personal one-hour-duration oxygen tank and mask.

SCORE AGAINST



High Costs

KICK a

COST REDUCTION REPORT to:
BH4 - COST REDUCTION OFFICE

EAA ATTRACTIONS



TICKETS AVAILABLE

On sale in Bldg 11 Exchange Store 10 a.m. to 2 p.m., no refunds: Astroworld — adults \$5, children \$4 (regular \$6.50 and \$5.50); Sea Arama — adults \$3.25, children \$2.25 (regular \$4.25 and \$3.25); ABC Interstate Theater tickets \$1.50; free Disney Magic Kingdom cards; free Six Flags Over Texas Fun Seekers cards and Lion Country Safari cards.

Dinner theaters: Windmill Dinner Theater *Everybody Loves Opal* starring Martha Raye, \$14/couple (regular \$22) not valid on Friday or Saturday nights; Dean Goss Dinner Theater now has Murray Schisgal comedy *Luv*, \$16/couple (regular \$22) through November 9 — not valid Saturday nights.

LADIES MORNING EXERCISE

Attention non-working dependents. Here is your chance to slim up before the holidays. A morning exercise class will start November 11 for 6 weeks at the Gilruth Recreation Center. The class will meet Tuesday and Thursday 9:15 to 10:15. The fee is \$8. To register and for further information call x3594.

NASA Dedicates New Data Bank

NASA recently dedicated the newly-expanded Scientific and Technical Information Facility in Linticum Heights, Md., near the Baltimore-Washington International Airport.

The facility is one of the largest and most comprehensive technical data banks in the world. It serves as the central depository for over 1.2 million items of aerospace-derived technology — the product of more than 15 years of NASA space and aeronautical research.

This vast reservoir of technical information, increasing at a rate of 80,000 items annually, is readily available to users by means of a unique computerized retrieval system.

The facility plays a key role in the transfer of space-developed technology to down-to-earth uses. Last year, operating from its former location in College Park, Md., it reported new technology developments regularly to more than 20,000 organizations and individuals. It also conducted over 10,000 individual searches for specific technical information.

Recent agreements now permit the facility's computerized retrieval system access to the vast data banks operated by the Department of Defense and the Energy Research and Development Administration.

The facility is operated for NASA's Scientific and Technical Information Office by the Informatics Information Systems Company. It employs 230 people including professional researchers, librarians and computer experts, with an annual payroll of over \$2.4 million.

VOLLEYBALL STARTS

EAA men's and women's volleyball will begin November 3 with registration at the Gilruth Center October 20-24. Contact Doug Burns at 3594 or Jackie Boykin at 4476.

Burns and Boykin are also contacts for employees interested in forming a seven-week night basketball league starting November 3, a JSC standing-challenge ladder for tug-of-war, and an individual free-throw shooting championship.

BEACON SUSPENDS REGULAR PUBLICATION

The EAA Executive Board has voted to suspend monthly publication of the *Beacon* as an economy move and because of *Roundup* EAA Attractions column coverage. Special *Beacons* and flyers will still be published to publicize special events.

INSTRUCTORS NEEDED

If interested in sharing your talent in arts and crafts, yoga, powder puff automotives or other recreational talents, contact the Gilruth Recreation Center x3594.

BATON LESSONS

Take this opportunity for your daughter to learn baton twirling from Becky Bourland, the Texas State Champion in 1973. Classes will begin soon at the Gilruth Recreation Center on Saturday mornings. The fee is \$8 per month. To register and for further information call x3594.



BELLY DANCING

Ladies — firm up and have fun at the same time in the belly dancing class which starts October 29 in the

Gilruth Center. It is terrific exercise for hips and abdomen while developing muscular control and coordination. The class will meet Mondays and Wednesdays from 5:30 to 6:15 p.m. for six weeks. The fee is \$16 and the class is limited to 15. There are only a few openings left so call x3594 now.

PECAN HARVEST

The JSC pecan grove harvest will be on Saturday, October 18 at 10 a.m. for EAA-card-holding employees. The trees will be shaken before the harvest and no climbing or beating will be allowed during the harvest. One sack per family will be provided. Parking will be along Avenue B near the grove road. Some of the pecans may need further maturing and it is recommended that they be spread out for a few days after harvesting.

Roundup Swap-Shop

Swap Shop advertising is available to JSC and on-site contractor personnel. Articles or services must be offered as advertised, without regard to race, religion, sex or national origin. Ads should be 20 words or less, including home telephone number. Name and office code must accompany, but need not be included in ad copy. Typed or printed copy must be received (AP3 Attn: Roundup) by Thursday of the week before publication.

BOATS

Info on prices, mkt value and condition of used Lido 14 sailboats for sale by owners. Hoover, 334-2392.
Big-wheel boat trailer, \$50. Spare 4x8 tire, wheel, hub \$5. Ward, 488-5445.
16-ft Delmajic tri-hull, 65 Merc, trlr, canvas cover, plus ski equip. 474-2988.

PETS

8-wk old Border Collie pups, take one or seven, make offer or free — hurry! They're getting bigger. 474-2408 after 4:30.
Free: nice house cat, all shots, spayed, housebroken. Keyes, 333-2132 after 5.
Baby boa, xint pet (?), a herpetologist's happy horoscope come true, only \$100. Rubenstein, 334-2354.
AKC-reg Dachshund puppies, blk-tan, 4-mos, wormed, must sell — make offer. 488-2122.

VEHICLES

70 Chevy 6 pickup, air and camper, good cond, \$1200. Davis, 633-1280.
Culver PQ8-A aircraft, 125 hp, trigear, trophy winner, 2-place, trade on quality auto such as Mercedes or sell. Michael, 333-2468.
67 Plym Fury II, better than avg cond, good body, eng, brakes, xmission, \$495. Michael, 333-2468.
Fuji 10-sp bike, new, all aluminum components, sew-up tires, white, \$295 (dealer price \$350). Michael, 333-2468.
69 VW squareback, AM/FM, air, good cond. 488-5017 after 4:30.

75 Plym Duster Custom, low miles, 6-cyl, auto, air, stereo, pwr steer, in warranty until June — mileage unlimited, \$3895. Ellis, 686-1923.

73 Fiat 128 4-dr sedan, 26,000 miles, xclnt gas mileage, \$1300. Diana, 644-6588 after 6.

70 Ford 4-dr hrtdp, air, pwrsteer-brakes, \$1250. Boles, 471-3709.

70 VW Campmobile poptop, \$2000. Boles, 471-3709.

68 Plymouth 2-dr hrtdp, 318, air, pwrsteer, roadable — passed state insp, needs front fenders, grill, \$125 or sell parts, 488-4139.

Rent crank up/down Coleman camper or 16-ft travel trailer. 488-2387.

74 Lemans, good cond, new tires, AM/FM, air, Evelyn, 483-3445.

71 Suzuki TM 125, bored to 145cc, new head, piston and rings, 3-bike trlr, boots, helmet and many accessories, \$495. 333-2437.

75 Kawasaki ZI 900, under 400 mi, cost \$2569 — sell \$2200. McKee, Baytown 424-7927.

C-10h 10-sp bike, good cond, \$80. 471-1930.

74 Chevy pickup 6-cyl, std, \$2650. 481-6439.

26-in 3-sp boy's bike, xint cond, \$30. 333-3425.

68 Benilli 125cc motorcycle, low miles, adult rider, \$175. Littleton, 334-1835.

Rent Beechcraft Musketeer, \$20/hr. Siler, 333-2787.

74 Kawasaki 90 minibike, exp chamber, ported, takes XR75s with ease. \$600 value for \$325. Canniff, 944-6513.

HOUSEHOLD ARTICLES

Tappan coppersone gas range, oven thermostat needs adjusting, sell \$65 or trade for good chest of drawers. Rhonda, 938-0171 after 6.

Singer sewing machine head, needs work, \$25; Singer buttonhole attachment, perfect, \$7.50. Beasley, 944-4281.

MISCELLANEOUS

1/2-hp 2.0-cfm aircompressor, 40-psi single piston, xtrs incl, \$125. Davis, 633-1280.

8-hp 4-sp Western Auto tiller, xclnt cond, \$300. Davis, 633-1280.

Yamaha studio piano and bench, ebony, xclnt cond, \$1000 firm. Stanley, 488-5506.

UofH football tickets: vs Fla State Nov 22; vs Tulsa Nov 29, two xclnt seats, resvd prkng, \$12. Behrend, 483-2961.

Gas builtin oven/range top, copper-tone, good cond, \$50. Jaschke, 483-2557.

White porcelain commode, new \$25. Jaschke, 483-2557.

Small table saw w/motor, cabinet, \$40. Littleton, 334-1835.

Bundy B-flat clarinet, xint cond, \$75. Edi, 334-5170 after 5.

5.30x12 4-ply new tire, \$10. Ferguson, 488-2329.

Now a magazine for computer and microprocessor hobbyists, latest on hdwe/sftwe applications. Gorman, 483-5501.

4x Bushnell Banner riflescope, post reticle, \$20. Larey, 479-3159.

PROPERTY & RENTALS

2-acre lot in Friendswood Eldorado subdiv, \$7500. Zupp, 482-7156.

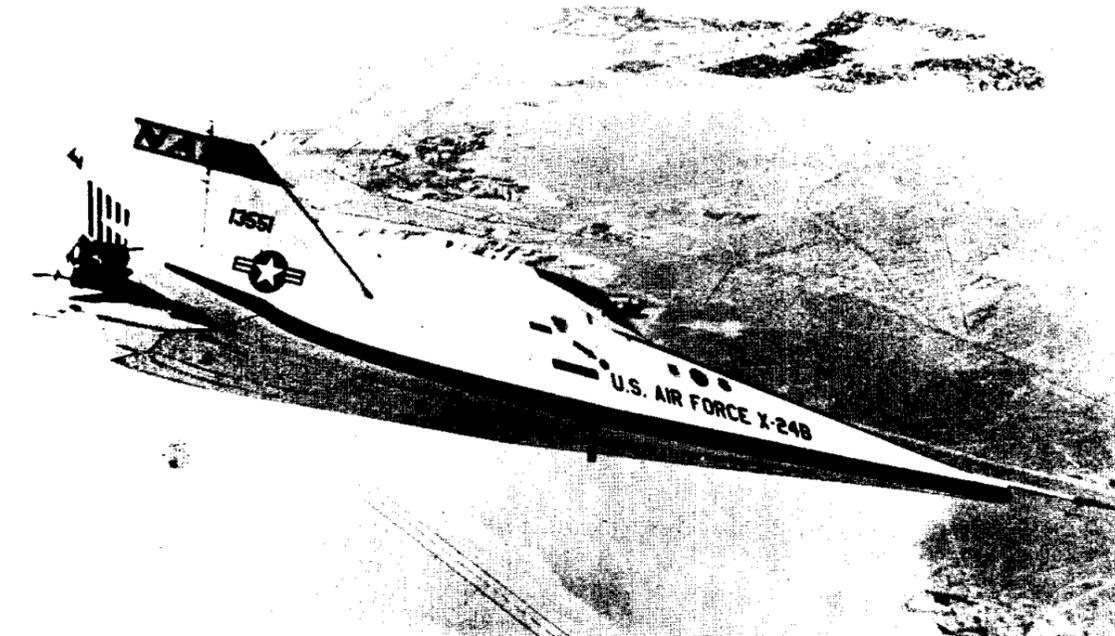
WANTED

26-in girl's single-speed bike in good cond. Doherty, 488-0182.

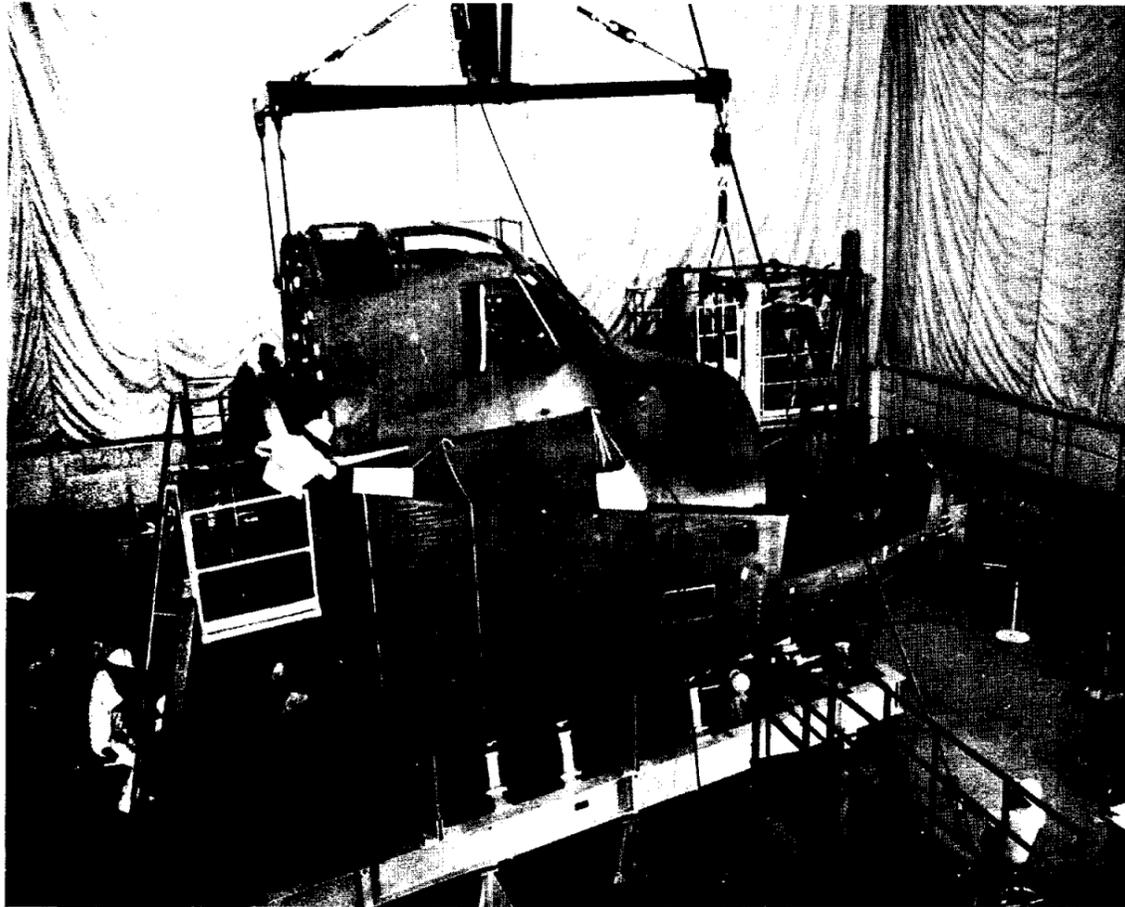
1/2-hp electric motor, gas heaters. Harris, 488-1003 Tue/Thur.

DON'T GET WASTED

NATIONAL FIRE PREVENTION WEEK



LAST OF A BREED — The NASA/USAF X-24B, shown here in an earlier approach to the NASA Flight Research Center runway at Edwards, Calif., made its final powered flight September 23 with research pilot William H. Dana at the controls. After release from the B-52 mother aircraft, Dana ignited three of the four XLR-11 rocket engines to accelerate to 1600 km/hr (1,000 mph) and climb to 21,000 meters (70,000 feet) before gliding to a 320 km/hr (200 mph) touchdown on the dry lakebed.



ORBITER'S FRONT OFFICE — A bridge crane lowers the Space Shuttle Orbiter crew compartment onto the lower forward fuselage during a recent fit check at Rockwell International Corporation Space Division's Downey, Calif. plant. The upper forward fuselage was also fit-checked over the crew compartment. Present plans call for delivery of the forward fuselage to RI's final assembly facility in Palmdale, Calif. this month, and delivery of the crew compartment in January. (RI Space Division photo)

Space Know-How Tackles Sewage Treatment Tasks

Design and construction of a million-gallon-a-day municipal pilot plant using a new cost-saving sewage treatment process derived from space research will begin this year in Southern California.

The new system converts solid sewage materials to activated carbon that then is used to treat the incoming wastewater. The pilot plant is intended to determine the design parameters for still larger treatment facilities for use of the new technique in processing sewage to meet pending federal environmental standards.

The Orange County Sanitation Districts have received federal, state and municipal grants totaling approximately \$2 million for the installation at an existing sewage treatment plant at Huntington Beach, Calif., midway between Los Angeles and San Diego.

The space research-derived process, developed by the Jet Propulsion Laboratory of Pasadena, Calif., is expected to exceed Environmental Protection Agency standards for ocean discharge and to reduce capital costs by 25 per cent as compared with conventional processing systems.

Under sponsorship of the NASA Office of Applications, JPL built a mobile demonstration unit which was operated successfully last year at the Orange County facility.

Key to the JPL system is a pyrolytic reactor that converts solid sewage material to activated carbon, which, in turn, treats the incoming wastewater. Testing of JPL's 10,000-gallon-per-day mobile unit produced the following results:

Virtual elimination of sewage solids.

Cleaner wastewater delivered to the ocean.

Removal of heavy metals contained in the sewage.

Elimination of odors.

Most municipal sewage treatment plants in the United States today provide only primary treatment. As a result, about 40 per cent of the solid waste material in raw sewage remains in the wastewater leaving the plants and is discharged into the nation's rivers and offshore waters.

The JPL system makes activated carbon of the hard-to-dispose-of solids, then uses the carbon to further treat the wastewater. The "used" carbon is recycled back with new sewage solids and reactivated, virtually closing the loop. Eventually some carbon and ash — dry, black, odorless powder — is extracted from the process and represents the only residue from the system.

To further close the process cycle, the gases generated from sewage solids are used as a source of power.

The pilot plant is expected to be in operation in Huntington Beach by 1976. Its sewage handling capacity of a million gallons a day will be 100 times that of the mobile unit JPL installed there a year ago. Evaluation of its performance will continue through 1976. Should the technique be adopted for urban waste treatment, another 100-fold scale-up will be required.

don't SHORT yourself



PLUG for SAFETY

GE Gets Orbiter ACE Contract

NASA has awarded an \$11.5 million contract to the General Electric Space Division of Houston to provide acceptance checkout equipment (ACE) for the Space Shuttle Orbiter.

The ACE system will be used to conduct standard tests and procedures and to detect variances in spacecraft systems while they are in assembly at the Orbiter plant in Palmdale, California. Rockwell International Corp. is responsible for the fabrication and integration of the Shuttle Orbiter at Palmdale.

Under the terms of the contract, GE will also provide checkout support during the approach and landing phases of the Shuttle missions. The contract will employ approximately 30 GE people at Palmdale and additional 80 GE people at JSC.

JSC Experiment on Soviet Satellite... (Continued from page 1)

are Dr. F. C. Steward and Dr. A. Krikorian, State University of New York at Stony Brook.

3. (K103) *Heavy Particle Radiation Experiment* — To measure HZE (high charge and energy) particle radiation on board the spacecraft. Small Lexan plastic nuclear track detectors will be placed inside the centrifuge, and stationary mounted biological containers.

Two large dosimeters 9 by 9 cm (3.5 by 3.5 in.) by 2 cm (.79 in.) will be mounted in a single container and located on the stationary platform. The data will be useful in planning for future flight experiments to ascertain the biological effects of HZE particles on organs such as the human brain and will be valuable in assessing hazards of HZE particles on long-duration manned space flights. Principal investigators are Dr. E. V. Benton, University of San Francisco, and Dr. S. T. Taketa, Ames Research Center.

4. (K104) *Fundulus Hetroclitus* (killifish or mummichog minnows)

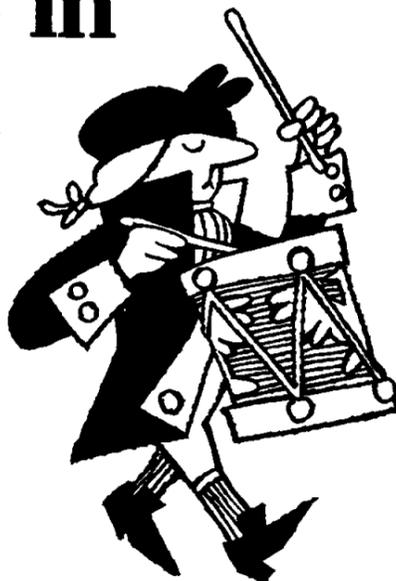
Embryogenesis — To evaluate weightlessness effect on development of the vestibular system, with emphasis on otolith mineralization, during embryonic development in a vertebrate animal. A package containing a series of the fish embryos representing key developmental stages will be placed in the satellite and exposed to weightlessness. A second package will be mounted on the one-gravity centrifuge. After recovery the flight test fish and ground controls will be observed for normalcy in vestibular functioning and also for microscopic and

physiological changes.

Principal investigators for the experiment are Dr. R. B. Hoffman and John F. Boyd, of JSC; Dr. J. R. Keefe and Dr. P. M. Fuller, University of Louisville; Dr. K. P. Kuchnow, Texas A & M University; and Dr. J. M. Oppenheimer, Bryn Mawr College, Pa. Dr. William Scheld of JSC will be Principal Coordinating Scientist.

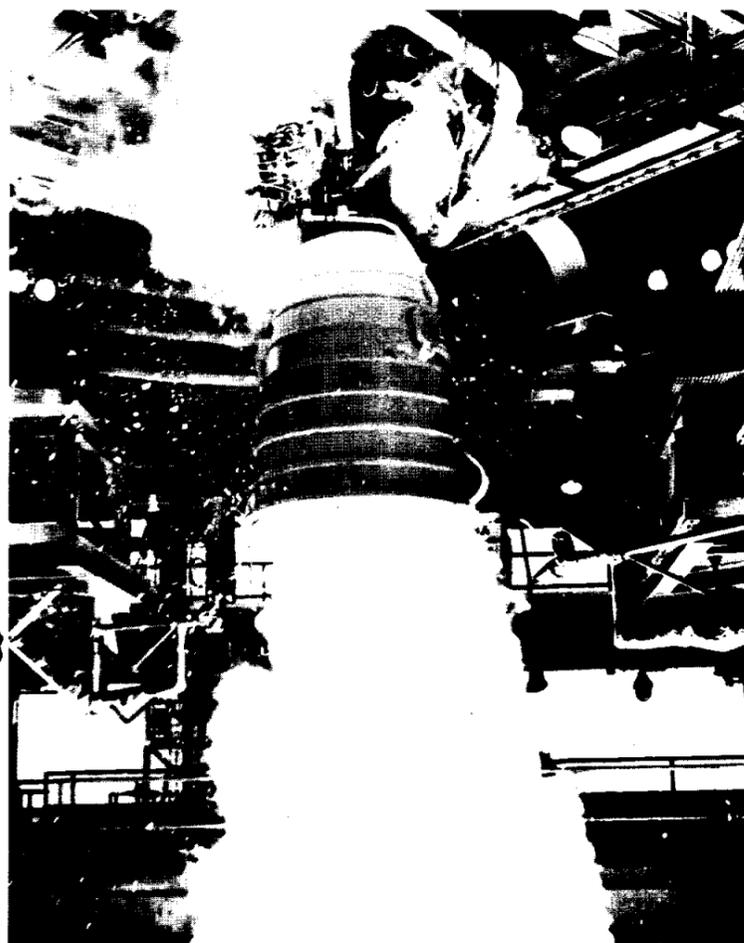
Soviet scientists will return the American experiment packages and prepare the rat and fly tissues for US scientists to carry out their investigations.

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FIRE IN THE HOLE! — A test version of the Space Shuttle main engine spews fire in a recent 1.6-second firing at the National Space Technology Laboratories, Bay St. Louis, Miss. The Rocketdyne Division of Rockwell International Corporation is conducting the short duration test series leading up to a full-duration firing. NASA Marshall Space Flight Center is responsible for developing the main engine, the external tank and the solid-rocket booster for the Space Shuttle.

JSC Amends Lockheed Pact

NASA has signed a \$44,800,000 contract amendment with the Lockheed Electronics Company, Inc. of Houston, for electronic, scientific and computing center support services at JSC.

The new amendment calls for Lockheed to provide support for five technical and scientific directorates at JSC. Specific programs included in this support are Space Shuttle, Earth resources aircraft, health applications and Large Crop Inventory Experiment, a program designed to determine the feasibility of assessing crop inventories from a satellite.

This amendment brings the estimated value of the Lockheed contract to \$173,100,000.